Drug-eluting microfibrous patches for the local delivery of rolipram in spinal cord repair.

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Public Summary:
Spinal cord injury (SCI) remains a major challenge for regenerative medicine. Following SCI, axon growth inhibitors and other inflammatory responses prevent functional recovery. Previous studies have demonstrated that rolipram, an anti-inflammatory and cyclic adenosine monophosphate preserving small molecule, improves spinal cord regeneration when delivered systemically. However, more recent studies showed that rolipram has some adverse effects in spinal cord repair. Here, we developed a drug-delivery platform for the local delivery of rolipram into the spinal cord. The potential of drug-eluting microfibrous patches for continuous delivery of high and low-dose rolipram concentrations was characterized in vitro. Following C5 hemisections, athymic rats were treated with patches loaded with low and high doses of rolipram. In general, animals treated with low-dose rolipram experienced greater functional and anatomical recovery relative to all other groups. Outcomes from the high-dose rolipram treatment were similar to those with no treatment. In addition, high-dose treated animals experienced reduced survival rates suggesting that systemic toxicity was reached. With the ability to control the release of drug dosage locally within the spinal cord, drug-eluting microfibrous patches demonstrate the importance of appropriate local release-kinetics of rolipram, proving their usefulness as a therapeutic platform for the study and repair of SCI.

Scientific Abstract:
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